No. 664,632. Patented Dec. 25, 1900.

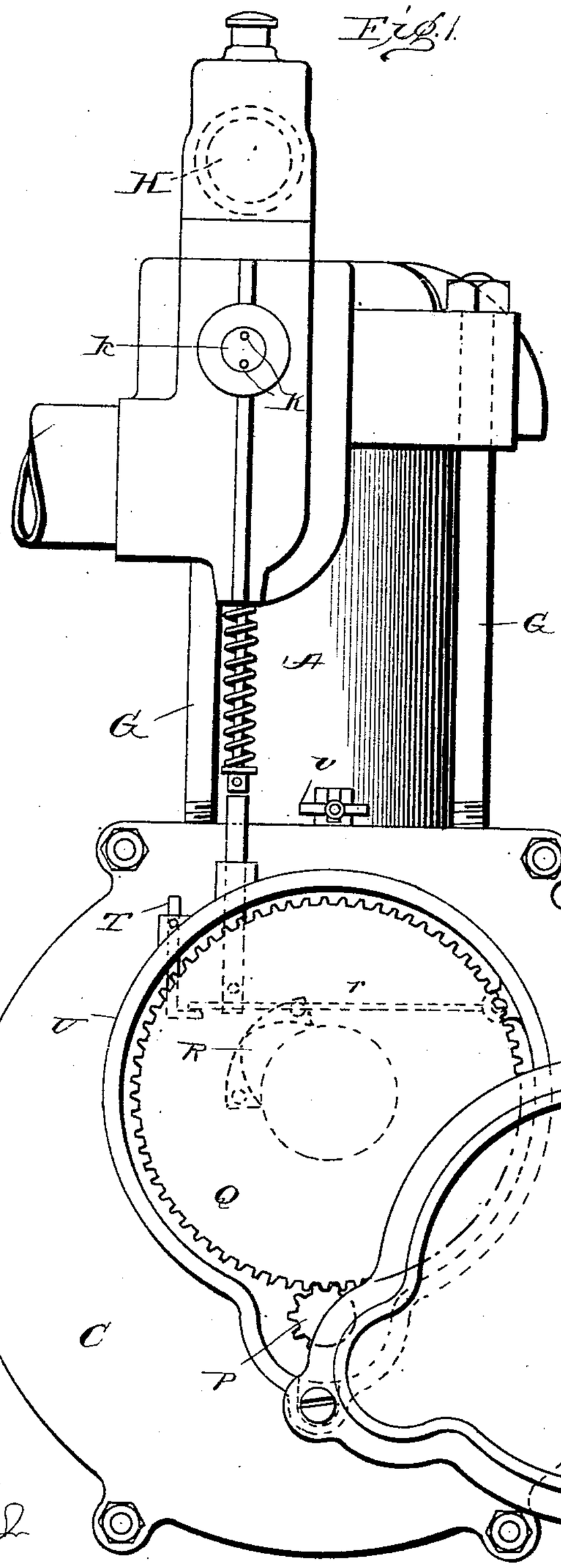
W. K. FREEMAN.

INTERNAL COMBUSTION ENGINE.

(Application filed Oct. 3, 1900.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.



Witnesses:
J. McFowler Jr.
Thomas Durant

Inventor:
Walter K. Freeman
by Church & Church
his Attys

No. 664,632.

Patented Dec. 25, 1900.

W. K. FREEMAN.

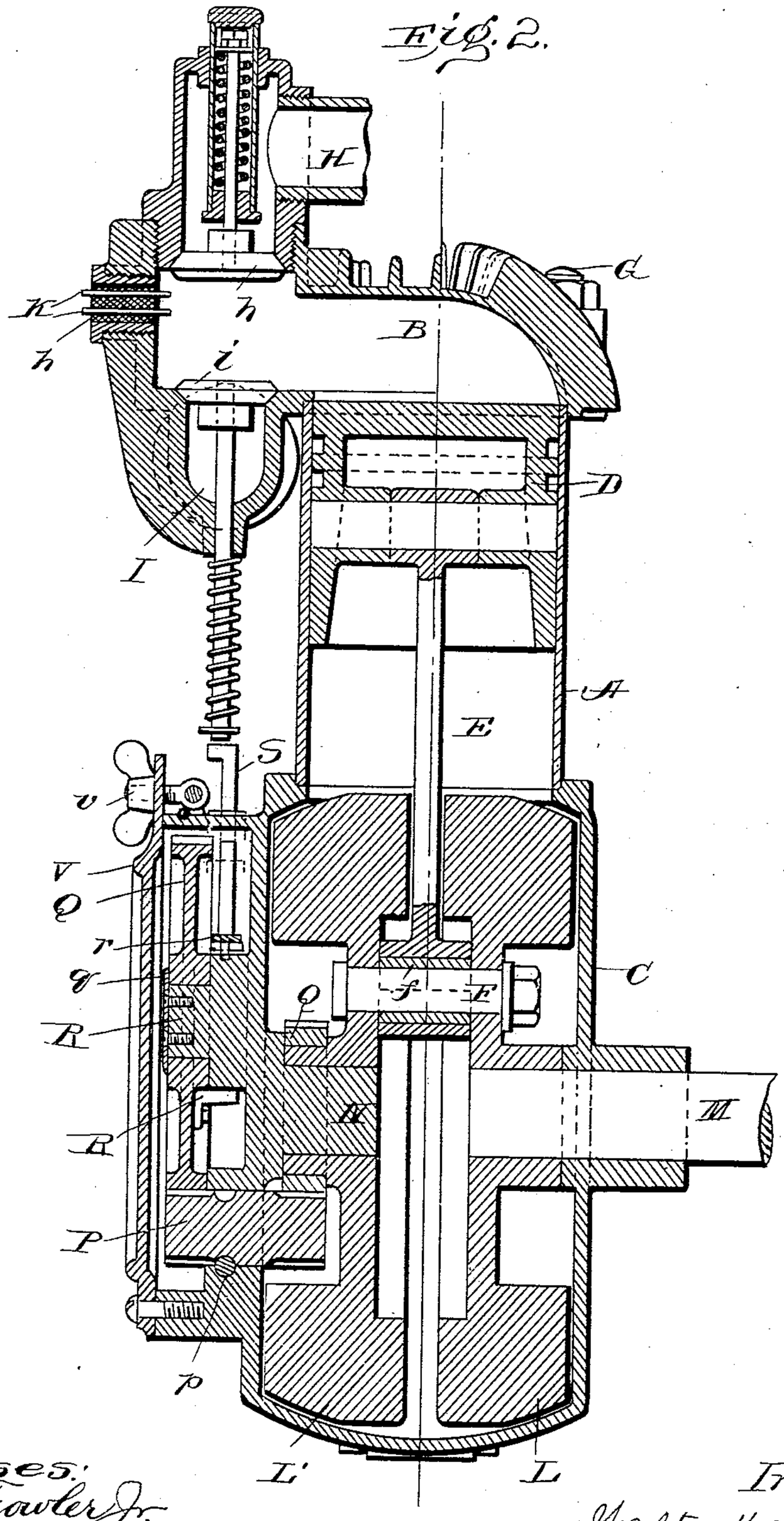
INTERNAL COMBUSTION ENGINE.

(Application filed Oct. 3, 1900.)

(No Model.)

2 Sheets—Sheet 2.

Fig. 2.



Witnesses:
J. McFowler Jr.
Thomas Durant

Inventor:
Walter K. Freeman
by Church & Church
his Attys

UNITED STATES PATENT OFFICE.

WALTER K. FREEMAN, OF SARATOGA SPRINGS, NEW YORK.

INTERNAL-COMBUSTION ENGINE.

SPECIFICATION forming part of Letters Patent No. 664,632, dated December 25, 1900.

Application filed October 3, 1900. Serial No. 31,898. (No model.)

To all whom it may concern:

Be it known that I, WALTER K. FREEMAN, a citizen of the United States, residing at Saratoga Springs, in the county of Saratoga and State of New York, have invented certain new and useful Improvements in Internal-Combustion Engines; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and to the letters of reference marked thereon.

This invention relates to improvements in engines the power for which is derived from the explosion of a gaseous medium in more or less intimate relation to a piston or moving part suitably connected with a crank-shaft by means of which the power is transmitted.

The invention has for its object to provide a simple and efficient construction of engine especially well adapted for use in automobile vehicles, although it will be understood the invention is not limited to such use.

The invention consists in certain novel details of construction and combinations and arrangements of parts, all as will be now described in the following specification and the particular features of novelty pointed out in the appended claims.

Referring to the accompanying drawings, Figure 1 is a side elevation of an internal-combustion engine embodying my present improvements, the face-plate on one side of the frame being swung open in order to disclose the valve-controlling gear. Fig. 2 is a vertical section taken through the engine at right angles to Fig. 1.

Like letters of reference on both figures indicate the same parts.

The working parts of the engine illustrated in the accompanying drawings consist of a cylinder A, having at one end an explosion and admission chamber B and at the other end a fly-wheel and crank-shaft housing C, while within the cylinder is mounted a piston D of any usual or preferred construction, connected, through the medium of a connecting-rod E, with a crank-pin F, the construction and mounting of which latter will be hereinafter more particularly described.

The housing C and explosion-chamber B are connected by tie-rods G and confine the cylinder between them, whereby the parts may be conveniently and quickly assembled.

The gas-admission port H opens into the explosion-chamber B and is provided with a spring-seated valve *h*, which is adapted to be unseated by the suction exerted by the piston, as is usual in this type of engine. The exhaust takes place through a port I under the control of a spring-seated valve *i*, adapted to be unseated by a valve-operating mechanism controlled from the crank-shaft and operating to unseat said valve at each alternate reciprocation of the piston, inasmuch as the type of engine illustrated is a four-cycle engine.

The explosive charge is ignited by sparks between the electrodes K entering the explosion-chamber through an insulating-plug *k*, and the creation of the sparks is controlled by any usual or appropriate mechanism heretofore employed for the purpose.

Within the housing C there is mounted a balance or fly wheel composed of two independent halves or sections L and L′, the former mounted rigidly on the inner end of the drive-shaft M and the latter L′ journaled upon an inwardly-projecting stud axle or bearing N on the side of the housing and in alinement with the crank-shaft M. These two halves of the balance or fly wheel are connected by the crank-pin F, and a sleeve *f* is preferably interposed in order to effect a more rigid union and prevent all danger of the two halves drawing together and so cramping or binding the connecting-rod E.

The balance or fly wheel, or more properly the half L′ thereof, is provided with a gear-wheel O, which constitutes what might be termed the "first" gear of the train of gears employed for driving or operating the valve. In the construction illustrated this gear-wheel O may be most conveniently mounted upon the hub portion of the section L′, and in order that the motion from this wheel may be conveniently transmitted to the outside of the housing a double pinion P is journaled in said housing at a point to one side of the axis of the fly-wheel, one end of said pinion being adapted to mesh with the wheel O and the other end with a gear-wheel Q, journaled on a stud axle or bearing R. This stud axle or bearing R is preferably located at a point on

the opposite side of the axis of the fly-wheel from that on which the pinion P is journaled and on the outer side of the housing.

The pinion P may be held against longitudinal movement by a key *p*, and it will be noted that the whole arrangement is such that the housing C may be cast in integral halves and the several stud axles or bearings on the left-hand half may be finished up or machined without difficulty. The gear-wheel Q may be held in place upon its journal by a plate *q*, and upon the rear or inner face of said wheel there is formed or mounted a cam R, adapted to coöperate with a lever *r*. The lever *r* in turn is adapted to engage a push-rod S, which coöperates with the stem of the valve *i* to elevate the same periodically and permit the exhaust to take place. The position of the lever *r* is determined by an adjustable stop T, extending to the outside of the casing through the annular wall U of the housing in convenient position to be adjusted by the attendant. The annular wall U referred to constitutes a housing for the gears P and Q, and it is adapted to be closed by a swinging cover V, preferably pivoted at the bottom and adapted to be held in closed position by a turnbuckle *v* at the top. The ratio of the gearing for operating the valve is such as to cause said valve to open during each alternate reciprocation of the piston, as is usual in this type of engine.

It will be noted that the two halves of the fly or balance wheel are recessed in their outer faces and the recesses are utilized for the accommodation of the gears O and P and for the accommodation of the head and nut of the crank-pin F. In the preferred construction the parts of the fly or balance wheel are adapted to run in close proximity to the walls of the housing, and thus the recesses before referred to are practically closed, and there is little or no danger of the parts becoming separated at the crank-pin by reason of the loosening of the nut, for even though said nut should become entirely loose the pin could not work entirely out and permit the engine to be destroyed by the force of the explosion. Furthermore, with this construction there is little or no danger of the parts becoming broken and flying about to the injury of the attendants.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an internal-combustion engine the combination with the cylinder, explosion-chamber and piston working in said cylinder with valves for the admission and exhaust of the explosive mixture and products of combustion respectively, of a housing connected with the cylinder, one side of said housing having an inwardly-projecting centrally-arranged stud axle or bearing and an outwardly-projecting stud axle or bearing, a fly-wheel journaled on said inwardly-projecting stud axle or bearing, a gear-wheel carried by said fly-wheel within the housing, a double pinion journaled in the wall of said housing and meshing with said gear-wheel, a second gear-wheel journaled on the outwardly-projecting stud axle or bearing and meshing with the outer end of said pinion, and a valve-operating mechanism operated by said last-mentioned gear-wheel; substantially as described.

2. In an internal-combustion engine the combination with the cylinder, explosion-chamber, piston and fly-wheel formed in two independent halves, united by the crank-pin, of a housing for said fly-wheel, a crank-shaft journaled in one side of said housing, and rigidly connected with one half of said fly-wheel, a stud-axle on the housing on which the opposite half of said fly-wheel is journaled, a gear-wheel connected with the fly-wheel, a pinion meshing with said gear-wheel, a second gear-wheel driven by said pinion and journaled on the outer side of said housing and a valve-operating mechanism operated by said last-mentioned gear-wheel; substantially as described.

3. In an internal-combustion engine the combination with the cylinder, explosion-chamber, piston and fly-wheel, of a housing for said fly-wheel having one of its sides formed with a bearing for the crank-shaft and its opposite side formed with an inwardly-projecting journal for the fly-wheel, an outwardly-projecting journal for the valve-operating gear-wheel and an outwardly-projecting annular flange, a gear-wheel mounted on the fly-wheel within the casing and a double pinion journaled in the wall of the housing and meshing with said gear-wheel, a second gear-wheel journaled on the outwardly-projecting bearing on the housing and meshing with said pinion, a valve-operating mechanism controlled by said last-mentioned gear-wheel and a face plate or cover seating on the outwardly-projecting flange of the housing for inclosing the valve-operating mechanism; substantially as described.

WALTER K. FREEMAN.

Witnesses:
E. GRIFFITH,
THOMAS DURANT.